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FREDERICK W. GIBB, III Gibb & Rahman, LLC 2568-A RIVA ROAD SUITE 304 ANNAPOLIS, MD 21401			EXAMINER RUGGLES, JOHN S	
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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/707,908  
Filing Date: January 23, 2004  
Appellant(s): BENZ, JASON M.

**MAILED**  
**NOV 16 2007**  
**GROUP 1700**

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Duane N. Moore  
For Appellant

**EXAMINER'S ANSWER**

**Attachment A:** Claims as Amended on 2/7/07

This is in response to the appeal brief filed on 9/14/07 appealing from the final Office action mailed on 4/20/07.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in section I. of the brief.

**(2) Related Appeals and Interferences**

The Examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in section III. of the brief is substantially correct, except for the following: (A) claims 2, 6-7, 9, 13-14, 16, and 19-20 have been canceled; (B) claims 8, 10-12, and 25 remain in objected to status (even though this objection is not under appeal and would be overcome by entry of the current claims appendix in the brief that corrects a misspelling in claim 8); (C) the rejection of claims 21-23 under the first paragraph of 35 U.S.C. 112 (as previously set forth in the 4/20/07 FINAL Office action on pages 3-4) is not argued by Appellant in the brief, so this rejection is not on appeal (this rejection is requested to be summarily sustained by the Board as not being contested by Appellant); and further exceptions described below due to what are believed to be typographical errors introduced by Appellant from inadvertent copying of the wrong text portions from earlier prosecution documents, in which these wrong text portions are not applicable to the 4/20/07 FINAL rejections under appeal.

Particularly, (D) in reference to the brief at page 3 lines 3-5 (which is abbreviated as p3/L3-5), claim 22 does not stand rejected over "either Dao or Schroeder" in view of the other cited references, but rather claim 22 stands rejected under 35 U.S.C. 103(a) as being

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unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of Tzu et al. (US 5,888,678), further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Applicant's admitted prior art (AAPA), and further in view of Sandstrom (US 2002/0125443), in which underlining is added for emphasis only. This latter ground of rejection on appeal was previously indicated in the FINAL (at p11-12).

Also for this same reason, (E) in the brief at p3/L6-22, it is believed that this entire paragraph should be disregarded as being another inadvertent repetition of irrelevant or unnecessary text copied from earlier prosecution documents.

#### **(4) Status of Amendments After Final**

The Appellant's statement of the status of amendments after final rejection contained in section IV. of the brief should be corrected as shown below.

The **first** proposed amendment after final rejection filed on 5/17/07 has not been entered, as indicated in the 5/31/07 Advisory Action. It is noted that contrary to Appellant's assertion in the brief, there was no indication whatsoever in this Advisory Action that the 5/17/07 first proposed after final amendment would be entered upon appeal.

Also, the **second** proposed amendment after final rejection filed on 6/6/07 has not been entered, as explained in the 6/22/07 Advisory Action.

Further, the **third** proposed amendment after final rejection filed on 6/27/07 has not been entered for the reasons given in the 7/10/07 Advisory Action.

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**(5) Summary of Claimed Subject Matter**

The long summary of claimed subject matter contained in section V. of the brief is substantially correct, except for the particular matters set forth below.

(A) In the second paragraph of this section in the brief (at p4/L4-6), again at p7/L15, and also at p10/L20-22 in the brief, *Figures 1A-3B* (as described in paragraphs [0018]-[0020] of the instant specification) that are relied upon by Appellant in the brief *are each identified as prior art* by the 10/5/06 amended drawings.

(B) At p7/L3 in the brief, “the first region 804” (at [0023] L11 in the specification) was amended on 2/7/07 to --the first region, in item 804--.

(C) At p8/L5 in the brief, Appellant attributes the phrase “to expose a first region” (singular) as coming from claim 8 that is supposed to be shown in Figures 4A-4B as described in [0021], but claim 8 L4 actually recites the phrase --to expose first regions-- (plural, see the last entered 2/7/07 amended claims appendix attached hereto) that is better shown in Figures 7A-7B as described in [0022].

(D) Similarly at p8/L15-16 in the brief, Appellant attributes the text “said first region comprises an uninterrupted rectangular surface” (singular) as coming from claim 8, but claim 8 L15-16 actually recite the text --said first regions comprise uninterrupted rectangular surfaces-- (plural). The most appropriate Figure(s) and corresponding description(s) thereof in the specification should likewise be corrected as indicated above.

(E) Additionally at p9/L3-4 in the brief, “etching said first region of said transparent substrate to create a phase shift region” (singular) should be --etching said first regions of said transparent substrate to create phase shift regions-- (plural), in accordance with claim 8 L7. The

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most appropriate Figure(s) and corresponding description(s) thereof in the specification should likewise be corrected as indicated above.

(F) Further at p9/L12 in the brief, the corrected spelling of the word --performing-- from claim 8 L9 is used without actually having been entered (note the last entered 2/7/07 amendment of claim 8 L9 in which this word is misspelled, as shown in the claims appendix attached hereto). The most appropriate Figure(s) and corresponding description(s) thereof in the specification should likewise be corrected as indicated above.

#### **(6) Grounds of Rejection to be Reviewed on Appeal**

The Appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct in short summary form with regard to the claims involved and the references applied, except that no anticipation under 35 U.S.C. 102 was relied upon by the Examiner (all of the appealed grounds of rejection are under 35 U.S.C. 103(a), instead). For clarification, the specific grounds of rejection to be reviewed on appeal are listed below.

*A. Claims 1, 3-5, 15, 17-18, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057).*

*B. Claims 1, 3-5, 15, 17-18, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), and further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA). Note that this rejection is based on a different*

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secondary interpretation of these claims from the interpretation used in the earlier art rejection of the same claims (in subsection A. above).

*C. Claims 8, 10-12, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), and further in view of Tzu et al. (US 5,888,678).*

*D. Claims 8, 10-12, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of Tzu et al. (US 5,888,678), and further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA). Note that this rejection is based on a different secondary interpretation of these claims from the interpretation used in the earlier art rejection of the same claims (in subsection C. above).*

*E. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA), and further in view of Sandstrom (US 2002/0125443).*

*F. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of Tzu et al. (US 5,888,678), further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA), and further in view of Sandstrom (US 2002/0125443).*

### **GROUND OF REJECTION NOT ON REVIEW**

The following grounds of rejection have not been withdrawn by the examiner, but they are not under review on appeal because they have not been presented for review in the Appellant's brief.

*G. Claims 21-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) still contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.* Further description of this rejection under the first paragraph of 35 U.S.C. 112 addressing new matter in claims 21-23 is presented in the 4/20/07 FINAL (see p3-4) and this rejection is further maintained in each of the 5/31/07, 6/22/07, and 7/10/07 Advisory Actions (see the continuation of item 11, under (A) in each of these Advisory Actions).

### **(7) Claims Appendix**

A substantially correct copy of the appealed claims appears in the section IX. Appendix of the Appellant's brief (see p70-74). The minor difference therein from the claims of the last entered 2/7/07 amendment (which is attached hereto for the Board's convenience) is to correct the misspelling of --performing-- (apparently inadvertently presented by Appellants at that time without the letter "p") in claim 8 L9. It is noted that Appellant's 5/17/07 and 6/6/07 proposed after final amendments did not properly correct this minor error in claim 8.



**(8) Evidence Relied Upon**

Dao et al.	US 5,302,477	4-1994
Schroeder et al.	US 2003/0027057	2-2003 (filed 8-2001)
Levenson	US 6,251,549	6-2001
Rolfson	US 6,395,432	5-2002
AAPA	Appellant's Admitted Prior Art	(filed 1-2004)
Tzu et al.	US 5,888,678	3-1999
Sandstrom	US 2002/0125443	9-2002

**(9) Grounds of Rejection**

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The following ground(s) of rejection are applicable to the appealed claims:

*A. Claims 1, 3-5, 15, 17-18, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057).*

Dao et al. teach an inverted phase-shifted reticle or mask (PSM) having adjacent inverted phase features with PS rims or phase edges between 0° and 180° phase features; and methods of fabricating the PSM (title, abstract). The methods of fabricating the PSM include performing first patterning or etching of an opaque chrome (Cr) mask layer 21 (*instant claims 4 and 18*) formed on a transparent quartz substrate 20 (as shown in Figure 7, *instant claim 5*) to expose a

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first region of the transparent substrate 20, which is etched to form a PS region 53 first opening (Figure 8, which also corresponds to 24 in Figures 10 and 4A). This is followed by performing additional second patterning or etching of the opaque Cr layer to expose an adjacent second region 27 of the transparent substrate to enlarge the first opening formed in the first region 24 over a continuous area of the transparent quartz substrate (as shown in Figure 4A, which clearly depicts Figure 10 without any Cr at all between the first region 24 and the adjacent second region 27, col. 8 line 46 to col. 9 line 13, *instant claims 3 and 17*). In the PSM shown by Figure 4A, a first (etched PS) rectangular region 24 is directly adjacent to a second (unetched non-PS) rectangular region 27, in which both the first rectangular region 24 and the second rectangular region 27 are similarly shaped and sized (col. 5 line 67 to col. 8 line 3). These methods of making a PSM are not limited to making a rim PSM, but these methods are also specifically contemplated to be applicable for making any other PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region, as exemplified by the PSM having a (rectangular) PS region 42b and a directly adjacent (rectangular) non-PS region 45a, which are shown in Figure 6 as having similar shapes and sizes (col. 8 lines 1-11).

Dao et al. does not expressly require that the first rectangular region has an uninterrupted rectangular surface lacking an intervening structure.

Schroeder et al. teach a phase shift mask 400 (PSM) and method of manufacturing the PSM (abstract). Figure 6A shows a PSM 400 having a transparent quartz substrate 402 (*instant claim 5*) with a first etched region 458 or 454 for a 180° phase (shift, PS) feature and an adjacent second unetched region 460 or 456 for a 0° phase (non-PS) feature next to an overlying patterned opaque chrome (Cr) layer 404 (paragraphs [0041]-[0047]). In the method of manufacturing the

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PSM, the opaque layer is preferably formed on the transparent substrate and patterned before etching of the underlying transparent substrate. Alternatively, the opaque layer can be patterned after etching the transparent substrate [0043]. The method for making the PSM in Figure 6A would reasonably be expected (especially in view of the Dao et al. method discussed above) to involve first patterning of an opening in the opaque layer, etching of the underlying transparent substrate at a first region 458 or 454 through the opening in the opaque Cr mask layer (*instant claims 4 and 18*), and additional patterning of the opaque layer to enlarge the opening that forms a second adjacent (non-PS) region 460 or 456 so that both PS and non-PS regions are formed over a continuous area of the transparent quartz substrate (*instant claims 3 and 17*). Figure 6B illustrates a top view of the PSM in Figure 6A that shows parallel lines for phase edge 452 between PS 458 and non-PS 460, as well as the adjacent edge of the patterned opaque Cr layer 404. These lines can extend only partially across the length of the mask 400 [0048], which is consistent with a rectangular first region 458 having an uninterrupted surface and an adjacent rectangular second region 460 having a similar shape. Even though the apparent width of non-PS region 460 in Figures 6A and 6B appears to be narrower than the adjacent PS region 458, non-PS region 456 on the other side of adjacent PS region 458 appears to have the same or similar width or size as the adjacent PS region 458. Also, PS region 454 appears to have the same or similar width or size as non-PS region 460.

It would have been obvious to one of ordinary skill in the art at the time of the invention in the method of making a PSM including first patterning of a first rectangular opening or region in an opaque layer and etching of an underlying transparent substrate, then additional patterning of the opaque layer for expanding the first rectangular opening or region, forming a similarly

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sized and shaped second rectangular opening or region in the opaque layer (as taught by Dao et al.), to make the first rectangular region or opening as an uninterrupted rectangular surface that lacks an intervening structure, because this is a simple alternative PSM configuration that is reasonably encompassed within “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region (as contemplated by Dao et al.). This would have been especially obvious in view of the known PSM configuration including an uninterrupted rectangular surface first region lacking an intervening structure and an adjacent rectangular second region having a similar shape (as taught by Schroeder et al.), because one of ordinary skill in the art would have a reasonable expectation of success in making this known PSM configuration (as taught by Schroeder et al.) by the method of making a PSM including first patterning of a first rectangular opening or region in an opaque layer and etching of an underlying transparent substrate, then additional patterning of the opaque layer for expanding the first rectangular opening or region, forming a similarly sized and shaped second rectangular opening or region in the opaque layer (as taught by Dao et al., reading on *instant claims 1, 15, 24, and 26*).

*B. Claims 1, 3-5, 15, 17-18, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), and further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant’s admitted prior art (AAPA). Note that this rejection is based on a different secondary interpretation of these claims from the interpretation used in the earlier art rejection of the same claims (in subsection A. above).*

While teaching other aspects of the instant claims, neither Dao et al. nor Schroeder et al. specifically teach a method of forming a PSM having adjacent first and second similarly shaped and sized rectangular 0° non-PS and 180° PS features or regions *in the particular configuration shown by instant Figure 5A or instant Figure 6A* (as specific examples of *instant claims 1, 3-5, 15, 17-18, 24, and 26*).

However, the particular configuration shown by instant Figure 5A or instant Figure 6A (for a PSM having book-matched adjacent first and second similarly shaped and sized rectangular 0° non-PS and 180° PS features or regions, wherein the first rectangular region has an uninterrupted rectangular surface that lacks an intervening structure) is either the same or very similar to the PSM configurations exemplified by either Levenson (Figures 9-11, col. 6 lines 53-61), Rolfson (Figure 12, col. 6 lines 28-36), or even AAPA (as shown in instant prior art Figures 1A to 3B, which Appellant admits at [0020] lines 1-5 to have the same PSM structure or configuration as shown by instant Figures 4A to 6B). So, it would have been obvious to one of ordinary skill in the art at the time of the invention in the methods of forming PSMs having adjacent first and second PS regions (as taught by Dao et al., especially in view of Schroeder et al.) to form these adjacent first and second PS regions in a book-matched configuration of similarly shaped and sized rectangular 0° non-PS and 180° PS features or regions, wherein the first rectangular region has an uninterrupted rectangular surface that lacks an intervening structure (as taught by either Levenson, Rolfson, or AAPA as exemplified by instant prior art Figures 1A to 3B), which has the same PSM structure exemplified by instant Figures 5A or 6A, in order to achieve a corresponding desired imaged pattern through such a PSM (*instant claims 1, 3-5, 15, 17-18, 24, and 26*).

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*C. Claims 8, 10-12, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), and further in view of Tzu et al. (US 5,888,678).*

While teaching other aspects of the instant claims, neither Dao et al. nor Schroeder et al. specifically teach forming additional third regions that are devoid of PS features (*instant claims 8, 10-12, and 25*).

Tzu et al. teach a PSM having separate PS mask patterns and non-PS binary mask patterns on the same mask substrate, as well as a method of forming this PSM (title, abstract). Formation of the PS mask patterns and binary mask patterns on the same transparent mask substrate increases throughput and decreases cost in the fabrication of integrated circuit wafers (abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention in the methods of forming PSMs having adjacent rectangular first and second PS regions that are similarly shaped and sized, wherein the first rectangular region has an uninterrupted rectangular surface that lacks an intervening structure (as taught by Dao et al., especially in view of Schroeder et al.) to form additional third binary mask pattern regions that are devoid of PS features on the same transparent mask substrate, in order to increase throughput and decrease cost in the fabrication of integrated circuit wafers (as taught by Tzu et al., *instant claims 8, 10-12, and 25*).

*D. Claims 8, 10-12, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of Tzu et al. (US 5,888,678), and further in view of either Levenson (US*

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6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA). Note that this rejection is based on a different secondary interpretation of these claims from the interpretation used in the earlier art rejection of the same claims (in subsection C. above).

While teaching other aspects of the instant claims, none of Dao et al., Schroeder et al., nor Tzu et al. specifically teach a method of forming a PSM having adjacent first and second similarly shaped and sized rectangular 0° non-PS and 180° PS features or regions, wherein the first rectangular region has an uninterrupted rectangular surface that lacks an intervening structure, *in the particular configuration shown by instant Figure 5A or instant Figure 6A* (as specific examples of *instant claims 8, 10-12, and 25*).

However, the particular configuration shown by instant Figure 5A or instant Figure 6A (for a PSM having book-matched adjacent first and second similarly shaped and sized rectangular 0° non-PS and 180° PS features or regions, wherein the first rectangular region has an uninterrupted rectangular surface that lacks an intervening structure) is either the same or very similar to the PSM configurations exemplified by either Levenson, Rolfson, or AAPA (as discussed above). So, it would have been obvious to one of ordinary skill in the art at the time of the invention in the methods of forming PSMs having adjacent first and second PS regions, wherein the first region has an uninterrupted rectangular surface that lacks an intervening structure, and separate additional third binary mask pattern regions that are devoid of PS features on the same transparent mask substrate (as taught by Dao et al., especially in view of Schroeder et al., in combination with Tzu et al.) to form the adjacent first and second PS regions in a book-matched configuration of similarly shaped and sized rectangular 0° non-PS and 180° PS features or regions (as taught by either Levenson, Rolfson, or AAPA as exemplified by instant prior art

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Figures 1A to 3B), which has the same PSM structure exemplified by instant Figures 5A or 6A, in order to achieve a corresponding desired imaged pattern through such a PSM (*instant claims 8, 10-12, and 25*).

*E. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA), and further in view of Sandstrom (US 2002/0125443).*

While teaching other aspects of the instant claims, neither Dao et al., Schroeder et al., Levenson, Rolfson, nor AAPA specifically teach a method of forming a PSM in which the etching of a first PS region and the subsequent additional patterning of an adjacent second non-PS region both attack the substrate of the PSM (*instant claims 21 and 23*).

Sandstrom teaches methods of making PSMs (title, abstract). Figure 3D shows a latter process step for making a PSM having a top non-transmitting/opaque region 302 (of one or more layers, on the left), which is directly adjacent to a first PS window/region 325 (etched into the substrate 100) that is deeper than another directly adjacent subsequently additionally patterned (etched) second non-PS window/region 327 (on the right) [0075]. The patterned non-transmissive/opaque material is typically Cr [0065]. Thus, the first etching step to pattern the PS region 325 and the subsequent additional patterning by etching to form the second region 327 both attack the substrate of the PSM (*instant claims 21 and 23*). Further etching during the additional patterning of the PSM substrate is useful for improving uniformity [0074].

It would have been obvious to one of ordinary skill in the art at the time of the invention in the method of forming a PSM having a first etched PS region and an adjacent second



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additionally patterned transmissive region enlarging a patterned opening in an opaque layer, such that the adjacent first and second regions are in a book-matched configuration of similarly shaped and sized rectangular PS and non-PS regions, wherein the first rectangular region has an uninterrupted rectangular surface that lacks an intervening structure (as taught by Dao et al., especially in view of Schroeder et al., in combination with either Levenson, Rolfson, or AAPA, which are discussed above) to have further attacked or etched the PSM substrate during the additional patterning step, because this further etching during additional patterning of the PSM substrate is useful for improving uniformity (as taught by Sandstrom, *instant claims 21 and 23*).

*F. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of Tzu et al. (US 5,888,678), further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA), and further in view of Sandstrom (US 2002/0125443).*

The teachings of Sandstrom are discussed above.

It would have been obvious to one of ordinary skill in the art at the time of the invention in the method of forming a PSM having first etched PS regions and adjacent second additionally patterned transmissive regions enlarging patterned openings in an opaque layer, such that the adjacent first and second regions are in book-matched configurations of similarly shaped and sized rectangular PS and non-PS regions, wherein the first rectangular regions each have an uninterrupted rectangular surface that lacks an intervening structure (as taught by Dao et al., especially in view of Schroeder et al., in combination with Tzu et al. and either Levenson, Rolfson, or AAPA, which are discussed above) to have further attacked or etched the PSM substrate during the additional patterning step, because this further etching during additional

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patterning of the PSM substrate is useful for improving uniformity (as taught by Sandstrom, *instant claim 22*).

#### **GROUND OF REJECTION NOT ON REVIEW**

*G. Claims 21-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) still contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.* These previously presented claims recite that in the independent claims from which they depend (instant claim 21 depends from instant claim 1, instant claim 22 depends from instant claim 8, and instant claim 23 depends from instant claim 23), the etching step and the additional patterning step both attack the substrate, which is not found to be specifically supported in the specification as originally filed.

The only original support previously provided by Appellant for the recitation that the etching step and the additional patterning step both attack the substrate is a broad reference to “Figures 4-6 and the accompanying text”. While the etching step of the transparent substrate 110 at region 114 in Figure 4B may be understood to include an attack of the (transparent) substrate, the only “additional patterning” that is specifically described in the specification as originally filed is the removal of an additional area “of the opaque layer 112 to expose a second region 116 of the transparent substrate 110” ([0020] lines 14-15, as shown in Figure 5B). The specification does **not** specifically describe any actual “attack” of the underlying transparent substrate during the additional patterning step. Therefore, these additional recitations are still believed to constitute new matter that must be cancelled from the claims.

**(10) Response to Argument**

*A. Claims 1, 3-5, 15, 17-18, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057).*

On pages 13-16 under sub-section A. 1. of the brief, Appellant restates the applicable rejection on appeal from the FINAL. The corresponding rejection is fully presented above in section (9) under the appropriate subheading for this sub-section A.

*Response to the arguments under sub-section A. 2. on pages 17-24 of the brief:*

**a. Independent Claims 1 and 15:**

In the brief on pages 17-19, Appellant argues against an unduly narrow interpretation of Dao et al. alone as teaching away from the instant method of forming a phase shift mask (PSM). In an attempt to show support for this narrow interpretation, Appellant relies on Figures 9-10 and a particular **example** thereof that includes the precise alignment of patterning layer 61 for centering PS rim 27 about opening 26 (col. 9 lines 3-5 of Dao et al.). Appellant contends that this particular Dao et al. example of making a rim PSM alone lacks *[1]* a first region that “comprises an uninterrupted rectangular surface” and *[2]* a second region that “comprises a similar shape and size as said first region” (which refers to a second opening in the opaque layer formed by additional patterning to enlarge the first opening in the opaque layer).

However, the rejection of these claims is not based on this particular rim PSM example of Dao et al. alone, but rather on other exemplary teachings of Dao et al. in combination with

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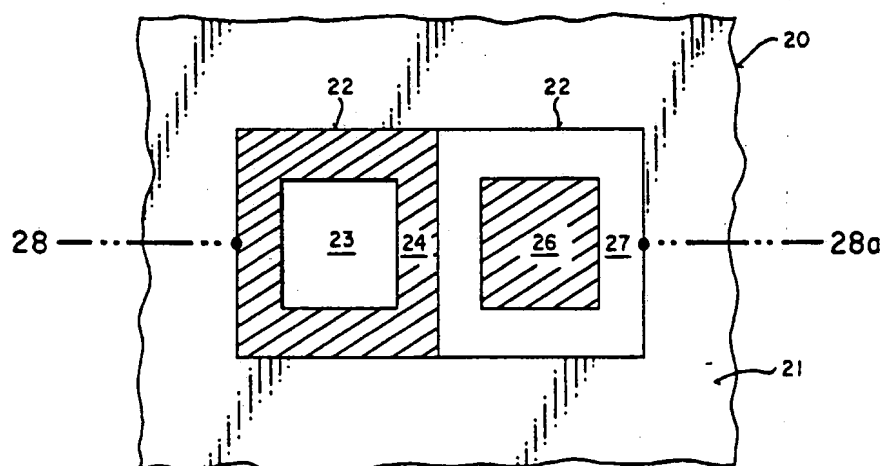
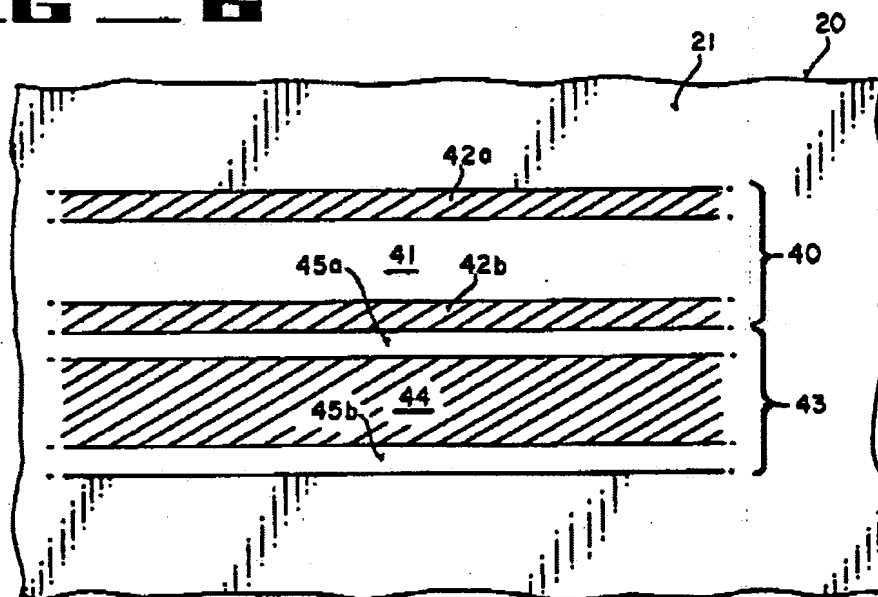
Schroeder et al. as previously described. In response to Appellant's arguments against the Dao et al. reference alone, one cannot show nonobviousness by attacking a reference individually where the rejection(s) relying upon each reference(s) is/are based on combination(s) of each reference with one or more other references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

As explained in the rejection above, Dao et al. teach methods of fabricating a PSM having phase edges between 0° and 180° phase features. These methods include first patterning or etching of an opaque Cr mask layer 21 formed on a transparent quartz substrate 20 (as shown in Figure 7) to expose a first region of the transparent substrate 20, which is etched to form a PS region 53 first opening (Figure 8, which also corresponds to 24 in Figures 10 and 4A). This is followed by performing additional second patterning or etching of the opaque Cr layer to expose an adjacent second region 27 of the transparent substrate for enlarging the first opening formed in the first region 24 over a continuous area of the transparent quartz substrate (as shown in Figure 4A, which clearly depicts Figure 10 without any Cr at all between the first region 24 and the adjacent second region 27, col. 8 line 46 to col. 9 line 13). In the PSM shown by Figure 4A, a first (etched PS) rectangular region 24 is directly adjacent to a second (unetched non-PS) rectangular region 27, in which both the first rectangular region 24 and the second rectangular region 27 are similarly shaped and sized (col. 5 line 67 to col. 8 line 3). These methods of making a PSM are **not** limited to making a rim PSM (contrary to Appellant's argument), but these methods are also *specifically contemplated to be applicable for making any other PSM pattern* having a PS element or region in close proximity to another (e.g., non-PS, etc.) region.

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This is *exemplified by the PSM having a PS region 42b and a directly adjacent non-PS region 45a, which are shown in Figure 6 as having similar shapes and sizes (col. 8 lines 1-11).*

For the Board's convenience, Dao et al. Figures 4A and 6 are reproduced below for illustration of these features.

**FIG 4A****FIG 6**

In response to Appellant's contention [2] stated above, Figure 4A of Dao et al. shows a PSM having a first rectangular PS region 24 and a directly adjacent second rectangular non-PS region 27, in which the first and second regions have similar shapes and sizes. Figure 6 of Dao et al. clearly shows that a similar PSM is made by equivalent method steps to have a second (non-PS) region 45a with a similar shape and size as the first (PS) region 42b, wherein the first region 42b and the second region 45a are directly adjacent to each other.

While Appellant's contention [1] as stated above is that the rim PSM taught by Dao et al. lacks a first region that "comprises an uninterrupted rectangular surface" (such as the PSM shown in Figure 4A above), this contention is not persuasive. First, the broad open language "comprises an uninterrupted rectangular surface" employed to describe the first region of the PSM recited in the instant claims permits a reasonably broad interpretation of the prior art teachings taken from Dao et al. This means that the first region 24 in Dao et al. Figure 4A can be seen to include the encompassed rectangular area 23 without being limited thereto. Clearly, area 23 is itself an uninterrupted rectangular surface (reading on the instant recitation that the first region "comprises an uninterrupted rectangular surface"). Second, the methods of forming a PSM taught by Dao et al. are **not limited to making only a particular rim PSM** (having a structure such as that shown in Figure 4A), but rather the methods of Dao et al. are *equally applicable to making any other PSM structure having adjacent PS and non-PS regions* (such as the configuration illustrated in Figure 6). In this regard, it is clear from Dao et al. Figure 6 that the first (PS) region 42b and the directly adjacent second (non-PS) region 45a each have similar shapes and sizes. Figure 6 also suggests that the first region is made without any intervening structure, even if the first region is not expressly required to have an uninterrupted rectangular

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surface. Thus, when taken as a whole, the teachings of Dao et al. suggest that the instant method of making a PSM having a first region that "comprises an uninterrupted rectangular surface" would have been obvious to one of ordinary skill in the art. Figure 6 of Dao et al. also would have lead one of ordinary skill in the art toward the expectation of success for using these same method steps for making other PSMs having similar structures, which provides sufficient motivation for considering the PSM configurations taught by Schroeder et al. The case of obviousness against the instant claims is further bolstered by including teachings of Schroeder et al. along with those of Dao et al.

Appellant asserts on pages 19-20 of the brief that the apparent difference in shape and size between regions 458 and 460 (as shown in Schroeder et al. Figures 6a and 6b) teach away from making a PSM having first and second regions in which "said second region comprises a similar shape and size as said first region". However, this assertion by Appellant is not convincing for at least the following reasons.

Schroeder et al. Figure 6A shows a PSM 400 having a transparent quartz substrate 402 with a first etched region 458 or 454 for a 180° phase (shift, PS) feature and an adjacent second unetched region 460 or 456 for a 0° phase (non-PS) feature next to an overlying patterned opaque chrome (Cr) layer 404 (paragraphs [0041]-[0047]). Figure 6B illustrates a top view of the PSM in Figure 6A that shows parallel lines for phase edge 452 between PS 458 and non-PS 460, as well as the adjacent edge of the patterned opaque Cr layer 404. Since these lines can extend only partially across the length of the mask 400 [0048], this is consistent with a rectangular first region 458 having an uninterrupted surface and an adjacent rectangular second region 460 having a similar shape. Even though the apparent width of non-PS region 460 in

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Figures 6A and 6B appears to be narrower than the adjacent PS region 458, non-PS region 456 on the other side of adjacent PS region 458 appears to have the same or similar width or size as the adjacent PS region 458. Also, PS region 454 appears to have the same or similar width or size as non-PS region 460. Thus, one of ordinary skill in the art would have sufficient reason in this reference to make adjacent PS and non-PS regions on the PSM in the known configuration having similar shapes and sizes.

As stated previously and again set forth above, it would have been obvious in the method of making a PSM taught by Dao et al. that includes separately forming the first and second rectangular regions in the opaque layer, forming similarly sized and shaped first and second rectangular openings in the opaque layer, to make the first rectangular region or opening as an uninterrupted rectangular surface that lacks an intervening structure, because this is a simple alternative PSM configuration that is reasonably encompassed within “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region (as contemplated by Dao et al.). Also, this would have been especially obvious in view of the known PSM configuration including an uninterrupted rectangular surface first region lacking an intervening structure and an adjacent rectangular second region having a similar shape (as taught by Schroeder et al.), because one of ordinary skill in the art would have a reasonable expectation of success in making this known PSM configuration (as taught by Schroeder et al.) by the method contemplated by Dao et al. to be suitable for making “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region (as exemplified in Dao et al. Figure 6, which is reproduced above).



**b. Dependent Claims 3 and 17:**

On page 20 of the brief, Appellant argues against the obviousness of dependent *instant claims 3 and 17* over the combination of Dao et al. and Schroeder et al. based solely on the previous arguments in the brief with respect to independent instant claims 1 and 15. Responses to these previous arguments are addressed above under sub-section A. a. for instant claims 1 and 15 (from which *instant claims 3 and 17* depend).

With respect to dependent *instant claims 3 and 17*, the instant recitations that the first and second regions comprise a continuous area on the transparent substrate (of the PSM) is met by the Dao et al. methods of forming a PSM that include performing additional second patterning or etching of the opaque Cr layer to expose an adjacent second region 27 of the transparent substrate to enlarge the first opening formed in the first region 24 over a continuous area of the transparent quartz substrate (as shown in Figure 4A reproduced above, which clearly depicts Figure 10 without any Cr at all between the first region 24 and the adjacent second region 27, col. 8 line 46 to col. 9 line 13, *instant claims 3 and 17*). In addition, the Schroeder et al. method for making the PSM in Figure 6A involves patterning of an opening in an opaque layer to form a first PS region 458 or 454 through the opening and additional patterning of the opaque layer to enlarge a first PS opening that forms a second adjacent (non-PS) region 460 or 456 so that both PS and non-PS regions are formed over a continuous area of the transparent quartz substrate (*instant claims 3 and 17*).

**c. Dependent Claims 4 and 18:**

Also on page 20 of the brief, Appellant argues against the obviousness of dependent *instant claims 4 and 18* over the combination of Dao et al. and Schroeder et al. based solely on the previous arguments in the brief with respect to independent instant claims 1 and 15.

Responses to these previous arguments are addressed above under sub-section *A. a.* for instant claims 1 and 15 (from which *instant claims 4 and 18* depend).

With respect to dependent *instant claims 4 and 18*, the recitations that the opaque layer comprises a Cr mask is met by the Cr mask layer 21 in Dao et al. (see Figures 7, 4A, and 6) and the patterned opaque chrome (Cr) layer 404 in Schroeder et al. (paragraphs [0041]-[0047], reading on *instant claims 4 and 18*).

**d. Dependent Claim 5:**

On pages 20-21 of the brief, Appellant argues against the obviousness of dependent *instant claim 5* over the combination of Dao et al. and Schroeder et al. based solely on the previous arguments in the brief with respect to independent instant claim 1. Responses to these previous arguments are addressed above under sub-section *A. a.* for instant claim 1 (from which *instant claim 5* depends).

With respect to dependent *instant claim 5*, the requirement that the transparent substrate comprises a quartz substrate is met by the Dao et al. transparent quartz substrate 20 (as shown in Figures 7, 4A, and 6) and the Schroeder et al. transparent quartz substrate 402 (as shown in Figure 6A, which each read on *instant claim 5*).

**e. Dependent Claims 24 and 26:**

On pages 21-24 of the brief, Appellant contests the obviousness of dependent *instant claims 24 and 26* over the combination of Dao et al. and Schroeder et al. Appellant repeats previous arguments on pages 17-20 in the brief that rely on an unduly narrow interpretation of Dao et al. alone as teaching away from the instant method of forming a phase shift mask (PSM). In an attempt to show support for this narrow interpretation, Appellant relies on Figures 9-10 and a particular **example** thereof that includes the precise alignment of patterning layer 61 for centering PS rim 27 about opening 26 (col. 9 lines 3-5 of Dao et al.). Responses to these previous arguments are addressed above under sub-section *A. a.* for instant claims 1 and 15 (from which *instant claims 24 and 26* depend).

Appellant also contends that this particular example of Dao et al. for making a rim PSM alone does not specifically teach **[3]** that the PSM first region comprises an uninterrupted rectangular surface that “lacks an intervening structure”. Appellant further asserts **[4]** that it would not have been obvious to combine Dao et al. (to which Appellant ascribes only an unduly narrow interpretation) with Schroeder et al.

While Appellant’s contention **[3]** as stated above is that in the particular example rim PSM shown by Figures 9-10 of Dao et al., the first region does not comprise an uninterrupted rectangular surface that “lacks an intervening structure”. Yet, in view of the PSM shown in Dao et al. Figure 4A (as reproduced above), this contention **[3]** is not persuasive.

First, the broad open language “comprises an uninterrupted rectangular surface” (in independent instant claims 1 and 15 from which *instant claims 24 and 26* depend, respectively) that “lacks an intervening structure” used to describe the first region of the PSM recited in the

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instant claims permits a reasonably broad interpretation of the prior art teachings taken from Dao et al. This means that the first region 24 in Dao et al. Figure 4A can be seen to include the encompassed rectangular area 23 without being limited thereto. Clearly, area 23 is itself an uninterrupted rectangular surface that lacks an intervening structure (reading on the instant recitation that the first region "comprises an uninterrupted rectangular surface" that "lacks an intervening structure").

Second, the methods of forming a PSM taught by Dao et al. are **not limited to making only a particular rim PSM** (having a structure such as that shown in Figure 4A), but rather the methods of Dao et al. are *equally applicable to making any other PSM structure having adjacent PS and non-PS regions* (such as the configuration illustrated in Figure 6). In this regard, it is clear from Dao et al. Figure 6 that the first (PS) region 42b and the directly adjacent second (non-PS) region 45a each have similar shapes and sizes. Figure 6 also suggests that the first region is made without any intervening structure, even if the first region is not expressly required to have an uninterrupted rectangular surface. Thus, when taken as a whole, the teachings of Dao et al. suggest that the instant method of making a PSM having a first region, which "comprises an uninterrupted rectangular surface" that "lacks an intervening structure", would have been obvious to one of ordinary skill in the art. Figure 6 of Dao et al. also would have lead one of ordinary skill in the art toward the expectation of success for using these same method steps for making other PSMs having similar structures to those in Figure 6, which provides sufficient motivation for considering the PSM configurations taught by Schroeder et al. (such as those shown in Figures 6A-6B). The case of obviousness against the instant claims is further bolstered by including the teachings of Schroeder et al. along with those of Dao et al.

Appellant argues on page 23 of the brief that the particular example rim PSM in Figure 10 of Dao et al. has a portion of Cr layer 21 remaining on the transparent substrate between the first region 24 and the second region 27. From this limited particular example rim PSM, Appellant seems to ignore all other express teachings of Dao et al. that clearly show configurations of the PSM in which the first and second regions are directly adjacent to each other (including those configurations specifically pointed out by the examiner in the FINAL rejection, which are repeated above, and those configurations discussed throughout the prosecution of this application against the claims presented). In fact, Appellant takes the further position that this limited particular example rim PSM of Figure 10 in Dao et al. somehow teaches away from the instantly recited PSM “wherein said second region is adjacent said first region”, but Appellant fails to specify any reason for this limited particular example rim PSM to steer one of ordinary skill in the art away from all the other PSM structures clearly taught by Dao et al. that **do show first and second regions directly adjacent to each other as being desirable.**

It is noted that Appellant’s unduly narrow interpretation of the Dao et al. teachings is different from the interpretation of this reference relied upon by the examiner in the rejections on appeal. In fact, the Appellant has failed to dispute several examples of PSM configurations in Dao et al. that each clearly show the PS first region and the non-PS second region directly adjacent to each other (for instance, see Figure 4A reproduced above). In the PSM shown by Figure 4A, **a first (etched PS) rectangular region 24 is directly adjacent to a second (unetched non-PS) rectangular region 27**, in which both the first rectangular region 24 and the second rectangular region 27 are similarly shaped and sized (col. 5 line 67 to col. 8 line 3). These methods of making a PSM as taught by Dao et al. are not limited to making a rim PSM, but these

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methods are also specifically contemplated to be applicable for making *any other PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region*, as exemplified by the PSM having a (rectangular) **first PS region 42b** and a **directly adjacent (rectangular) second non-PS region 45a**, which are shown in Figure 6 (that is reproduced above) as having similar shapes and sizes (col. 8 lines 1-11).

Contrary to Appellant's limited perspective of Dao et al., the plural examples taught by Dao et al. (in, e.g., Figure 4A, Figure 6, etc.) of directly adjacent first and second regions on the PSM along with other express teachings of **Dao et al. show clear direction to one of ordinary skill in the art for the desirability of placing a PS first region and a non-PS second region directly adjacent to each other, particularly in order to achieve a clear phase edge between 0° and 180° phase features** (as previously pointed out).

Appellant asserts on pages 23-24 of the brief that the apparent difference in shape and size between regions 458 and 460 (as shown in Schroeder et al. Figures 6a and 6b) teach away from making a PSM having first and second regions in which "said second region comprises a similar shape and size as said first region". However, this assertion by Appellant is not convincing for at least the following reasons.

Schroeder et al. Figure 6A shows a PSM 400 having a transparent quartz substrate 402 with a first etched region 458 or 454 for a 180° phase (shift, PS) feature and an adjacent second unetched region 460 or 456 for a 0° phase (non-PS) feature next to an overlying patterned opaque chrome (Cr) layer 404 (paragraphs [0041]-[0047]). Figure 6B illustrates a top view of the PSM in Figure 6A that shows parallel lines for phase edge 452 between PS 458 and non-PS 460, as well as the adjacent edge of the patterned opaque Cr layer 404. Since these lines can

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extend only partially across the length of the mask 400 [0048], this is consistent with a rectangular first region 458 having an uninterrupted surface and an adjacent rectangular second region 460 having a similar shape. Even though the apparent width of non-PS region 460 in Figures 6A and 6B appears to be narrower than the adjacent PS region 458, non-PS region 456 on the other side of adjacent PS region 458 appears to have the same or similar width or size as the adjacent PS region 458. Also, PS region 454 appears to have the same or similar width or size as non-PS region 460. Thus, one of ordinary skill in the art would have sufficient reason in this reference to make adjacent PS and non-PS regions on the PSM in the known configuration having similar shapes and sizes.

As stated previously and again set forth above, it would have been obvious in the method of making a PSM taught by Dao et al. that includes separately forming the first and second rectangular regions in the opaque layer, forming similarly sized and shaped first and second rectangular openings in the opaque layer, to make the first rectangular region or opening as an uninterrupted rectangular surface that lacks an intervening structure, because this is a simple alternative PSM configuration that is reasonably encompassed within “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region (as contemplated by Dao et al.). Also, this would have been especially obvious in view of the known PSM configuration including an uninterrupted rectangular surface first region lacking an intervening structure and an adjacent rectangular second region having a similar shape (as taught by Schroeder et al.), because one of ordinary skill in the art would have a reasonable expectation of success in making this known PSM configuration (as taught by Schroeder et al.) by the method contemplated by Dao et al. to be suitable for making “any” PSM pattern having a PS element or

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region in close proximity to another (e.g., non-PS, etc.) region (as exemplified in Dao et al. Figure 6, which is reproduced above).

In response to Appellant's further assertion [4] as stated above that there is no suggestion to combine the references (Dao et al. and Schroeder et al.), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation for combining the secondary Schroeder et al. reference(s) with Dao et al. is found at least in Dao et al. (as discussed above).

*B. Claims 1, 3-5, 15, 17-18, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), and further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA). Note that this rejection is based on a different secondary interpretation of these claims from the interpretation used in the earlier art rejection of the same claims (under subsection A. above).*

On pages 24-25 under sub-section B. 1. of the brief, Appellant restates the applicable rejection on appeal from the FINAL. The corresponding rejection is fully presented above in section (9) under the appropriate subheading for this sub-section B.



Response to the arguments under sub-section B. 2. on pages 26-36 of the brief:

**a. Independent Claims 1 and 15:**

On pages 26-29 of the brief, Appellant repeats previous arguments from pages 17-20 of the brief contesting the obviousness of independent *instant claims 1 and 15* over the combination of Dao et al. and Schroeder et al. Responses to these previous arguments from pages 17-20 of the brief are addressed above under sub-section A. a. for *instant claims 1 and 15*.

On pages 29-32 of the brief, Appellant presents additional arguments contesting the obviousness of independent *instant claims 1 and 15* over Dao et al. and Schroeder et al. in combination with either Levenson, Rolfson, or AAPA.

Initially, it is noted that on page 29 in the first full paragraph and on page 30 in the second full paragraph of the brief, Appellant's selective quotes from the FINAL are taken out of context and these selective quotes do not properly represent the corresponding rejection of claims now on appeal under this section. For a full re-statement of the corresponding rejection of claims as interpreted at the FINAL, see section (9) sub-section B. above.

In response to Appellant's arguments on pages 29-31 of the brief that Levenson and Rolfson each disclose *simultaneously* forming the first and second regions of a PSM, which Appellant asserts as teaching away from the methods of separately forming the first and second regions of the PSM (as taught by Dao et al., especially in view of Schroeder et al., discussed above), the test for obviousness is not whether the features (or methods) of a secondary reference may be bodily incorporated into the structure or method of one or more primary references; nor is it that the claimed invention must be expressly suggested in any one or all of the references.

Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

As set forth above, it would have been obvious in the method of making a PSM taught by Dao et al. that includes separately forming the first and second rectangular regions in the opaque layer, forming similarly sized and shaped first and second rectangular openings in the opaque layer, to make the first rectangular region or opening as an uninterrupted rectangular surface that lacks an intervening structure, because this is a simple alternative PSM configuration that is reasonably encompassed within “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region (as contemplated by Dao et al.). Also, this would have been especially obvious in view of the known PSM configuration including an uninterrupted rectangular surface first region lacking an intervening structure and an adjacent rectangular second region having a similar shape (as taught by Schroeder et al.), because one of ordinary skill in the art would have a reasonable expectation of success in making this known PSM configuration (as taught by Schroeder et al.) by the method contemplated by Dao et al. to be suitable for making “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region. **Dao et al. show clear direction to one of ordinary skill in the art for the desirability of placing a PS first region and a non-PS second region *directly adjacent to each other*, particularly in order to achieve a clear phase edge between 0° and 180° phase features** (as previously pointed out).

In the paragraph bridging pages 31-32 in the brief, Appellant has misunderstood the FINAL by selectively quoting ‘the particular configuration shown by instant Figure 5A or instant Figure 6A’ out of context to mean that instant Figures 5A or 6A are themselves “admitted as

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prior art by Appellants". However, it is actually instant **Figure 3A** that is clearly labeled to be **prior art**.

Instant **prior art Figure 3A** and instant Figures 5A and 6A (as amended on 10/5/06) are each reproduced below for the Board's convenience.

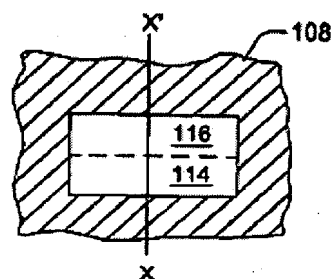


FIG. 5A

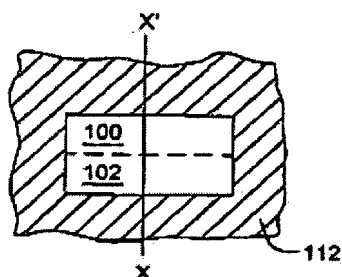
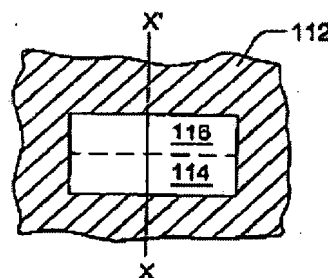
FIG. 3A  
PRIOR ART

FIG. 6A

A comparison of instant **prior art Figure 3A** to those of either instant Figure 5A or 6A (as illustrated above) clearly shows that all three of these drawings have the same PSM configuration of book-matched adjacent first and second similarly shaped and sized rectangular 0° non-PS and 180° PS features or regions, wherein the first rectangular region has an uninterrupted rectangular surface that lacks an intervening structure. Furthermore, Appellant admits in the instant specification at [0020] L1-5 that instant prior art Figures 1A to 3B have the "same structure" (L4-5, or configuration) for the PSM as shown by instant Figures 4A to 6B (which was previously pointed out before FINAL, as well as having been repeated in the

FINAL). It is apparent in further view of the instant specification at [0018] L1-4 that Appellant is proposing to make *the same known PSM structure* exemplified in **prior art Figure 3A** by what is claimed to be “an improvement on this methodology” (or *by a different method*) to make the PSM structure illustrated in Figure 5A or 6A.

**b. Dependent Claims 3 and 17:**

On page 32 of the brief, Appellant contests the obviousness of dependent *instant claims 3 and 17* over the combination of Dao et al. and Schroeder et al. (which are understood to be in further combination with either Levenson, Rolfson, or AAPA) based on the previous arguments in the brief with respect to independent instant claims 1 and 15. Responses to these previous arguments are addressed under sub-section *B. a.* above for the secondary interpretation of instant claims 1 and 15 (from which *instant claims 3 and 17* depend) and under sub-section *A. b.* above for the corresponding dependent claim limitations.

**c. Dependent Claims 4 and 18:**

Also on page 32 of the brief, Appellant contests the obviousness of dependent *instant claims 4 and 18* over the combination of Dao et al. and Schroeder et al. (which are understood to be in further combination with either Levenson, Rolfson, or AAPA) based on the previous arguments in the brief with respect to independent instant claims 1 and 15. Responses to these previous arguments are addressed under sub-section *B. a.* above for the secondary interpretation of instant claims 1 and 15 (from which *instant claims 4 and 18* depend) and under sub-section *A. c.* above for the corresponding dependent claim limitations.

**d. Dependent Claim 5:**

Further on page 32 of the brief, Appellant contests the obviousness of dependent *instant claim 5* over the combination of Dao et al. and Schroeder et al. (which are understood to be in further combination with either Levenson, Rolfson, or AAPA) based on the previous arguments in the brief with respect to independent instant claim 1. Responses to these previous arguments are addressed under sub-section *B. a.* above for the secondary interpretation of instant claim 1 (from which *instant claim 5* depends) and under sub-section *A. d.* above for the corresponding dependent claim limitations.

**e. Dependent Claims 24 and 26:**

On pages 33-36 of the brief, Appellant contests the obviousness of dependent *instant claims 24 and 26* over the combination of Dao et al. and Schroeder et al. (which are understood to be in further combination with either Levenson, Rolfson, or AAPA) based on the previous arguments in the brief with respect to independent instant claims 1 and 15. Responses to these previous arguments are addressed under sub-section *B. a.* above for the secondary interpretation of instant claims 1 and 15 (from which *instant claims 24 and 26* depend) and under sub-section *A. e.* above for the corresponding dependent claim limitations.

*C. Claims 8, 10-12, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), and further in view of Tzu et al. (US 5,888,678).*

On pages 36-37 under sub-section C. 1. of the brief, Appellant restates the applicable rejection on appeal from the FINAL. The corresponding rejection is fully presented above in section (9) under the appropriate subheading for this sub-section C.

Response to the arguments under sub-section C. 2. on pages 37-46 of the brief:

**a. Independent Claim 8:**

On pages 37-40 of the brief, Appellant traverses the obviousness of independent *instant claim 8* over the combination of Dao et al., Schroeder et al., and Tzu et al. by initially arguing against the Tzu et al. reference alone.

However, one cannot show nonobviousness by attacking a reference (e.g., Tzu et al., etc.) individually where the corresponding rejection of claims is based on a combination of this reference (e.g., Tzu et al., etc.) with one or more other references (e.g., Dao et al. and Schroeder et al., etc.). See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The reasons for combining Tzu et al. with the other references have been previously stated and are again set forth above. Tzu et al. teach that forming additional third binary mask pattern regions that are devoid of PS features on the same transparent mask substrate having PS features increases throughput and decreases cost in the fabrication of integrated circuit wafers. Tzu et al. is not relied upon to teach the additional aspects of the rejected claim(s) that are already taught by the other applicable references (Dao et al. and Schroeder et al.).

In response to Appellant's arguments that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or

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modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation for combining the secondary reference Tzu et al. with Dao et al. and Schroeder et al., is found at least in Tzu et al. (as discussed above).

In response to Appellant's additional arguments that Tzu et al. teach *simultaneously* forming the first and second regions of a PSM, which Appellant contends to teach away from the methods of separately forming the first and second regions of the PSM (as taught by Dao et al. and Schroeder et al., discussed above), the test for obviousness is not whether the features (or methods) of a secondary reference may be bodily incorporated into the structure or method of one or more primary references; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

As set forth above, it would have been obvious in the method of making a PSM taught by Dao et al. that includes separately forming the first and second rectangular regions in the opaque layer, forming similarly sized and shaped first and second rectangular openings in the opaque layer, to make the first rectangular region or opening as an uninterrupted rectangular surface that lacks an intervening structure, because this is a simple alternative PSM configuration that is reasonably encompassed within “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region (as contemplated by Dao et al.). Also, this would

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have been especially obvious in view of the known PSM configuration including an uninterrupted rectangular surface first region lacking an intervening structure and an adjacent rectangular second region having a similar shape (as taught by Schroeder et al.), because one of ordinary skill in the art would have a reasonable expectation of success in making this known PSM configuration (as taught by Schroeder et al.) by the method contemplated by Dao et al. to be suitable for making “any” PSM pattern having a PS element or region in close proximity to another (e.g., non-PS, etc.) region. **Dao et al. show clear direction to one of ordinary skill in the art for the desirability of placing a PS first region and a non-PS second region *directly adjacent to each other*, particularly in order to achieve a clear phase edge between 0° and 180° phase features** (as previously pointed out).

The remaining arguments in this section on pages 40-42 of the brief against Dao et al. and Schroeder et al. (which are understood to be in combination with Tzu et al.) with respect to applicable aspects of independent *instant claim 8* are merely repetitive of earlier arguments on pages 17-20 of the brief (with respect to similarly applicable aspects of independent claims 1 and 15). Responses to these repeated earlier arguments with respect to *instant claim 8* are believed to be adequately addressed above in subsection *A. a.* (with respect to similarly applicable aspects of independent instant claims 1 and 15).

**b. Dependent Claim 10:**

On page 42 of the brief, Appellant argues against the obviousness of dependent *instant claim 10* over the combination of Dao et al., Schroeder et al., and Tzu et al. based solely on the previous arguments in the brief with respect to independent instant claim 1 (which should have



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been independent instant claim 8 since this is the appropriate base claim). Responses to these previous arguments are addressed above under sub-section C. **a.** for instant claim 8 (from which *instant claim 10* depends).

**c. Dependent Claim 11:**

On page 43 of the brief, Appellant argues against the obviousness of dependent *instant claim 11* over the combination of Dao et al., Schroeder et al., and Tzu et al. based solely on the previous arguments in the brief with respect to independent instant claim 1 (which should have been independent instant claim 8 since this is the appropriate base claim). Responses to these previous arguments are addressed above under sub-section C. **a.** for instant claim 8 (from which *instant claim 11* depends).

With respect to dependent *instant claim 11*, the recitation that the opaque layer comprises a Cr mask is met by the Cr mask layer 21 in Dao et al. (see Figures 7, 4A, and 6) and the patterned opaque chrome (Cr) layer 404 in Schroeder et al. (paragraphs [0041]-[0047], reading on *instant claim 11*).

**d. Dependent Claim 12:**

Also on page 43 of the brief, Appellant argues against the obviousness of dependent *instant claim 12* over the combination of Dao et al., Schroeder et al., and Tzu et al. based solely on the previous arguments in the brief with respect to independent instant claim 1 (which should have been independent instant claim 8 since this is the appropriate base claim). Responses to

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these previous arguments are addressed above under sub-section C. a. for instant claim 8 (from which *instant claim 12* depends).

With respect to dependent *instant claim 12*, the requirement that the transparent substrate comprises a quartz substrate is met by the Dao et al. transparent quartz substrate 20 (as shown in Figures 7, 4A, and 6) and the Schroeder et al. transparent quartz substrate 402 (as shown in Figure 6A, which each read on *instant claim 12*).

**e. Dependent Claim 25:**

On pages 43-46 of the brief, Appellant contests the obviousness of dependent *instant claim 25* over the combination of Dao et al. and Schroeder et al. (which are understood to be in further combination with Tzu et al.). Appellant repeats previous arguments on pages 17-20 and 40-42 in the brief that rely on an unduly narrow interpretation of Dao et al. alone as teaching away from the instant method of forming a phase shift mask (PSM). In an attempt to show support for this narrow interpretation, Appellant relies on Figures 9-10 and a particular **example** thereof that includes the precise alignment of patterning layer 61 for centering PS rim 27 about opening 26 (col. 9 lines 3-5 of Dao et al.). Responses to these previous arguments are addressed above under at least sub-section A. a. for instant claims 1 and 15 and sub-section C. a. for instant claim 8 (from which *instant claim 25* depends).

*D. Claims 8, 10-12, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of Tzu et al. (US 5,888,678), and further in view of either Levenson (US*

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6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA). Note that this rejection is based on a different secondary interpretation of these claims from the interpretation used in the earlier art rejection of the same claims (under subsection C. above).

On pages 46-48 under sub-section D. 1. of the brief, Appellant restates the applicable rejection on appeal from the FINAL. The corresponding rejection is fully presented above in section (9) under the appropriate subheading for this sub-section D.

Response to the arguments under sub-section D. 2. on pages 48-60 of the brief:

**a. Independent Claim 8:**

On pages 48-50 of the brief, Appellant repeats previous arguments from pages 37-40 of the brief contesting the obviousness of independent *instant claim 8* over the combination of Dao et al., Schroeder et al., and Tzu et al. (these previous arguments on pages 48-50 of the brief are initially based on Tzu et al. alone). Then on pages 50-53 of the brief, Appellant repeats more previous arguments from pages 40-42 of the brief. Responses to each of these previous arguments from pages 37-42 of the brief are addressed above under sub-section C. a. for *instant claim 8*.

On pages 53-56 of the brief, Appellant repeats further previous arguments from pages 29-32 of the brief contesting the use of either Levenson, Rolfson, or AAPA (in the combination of any of these references along with Dao et al., Schroeder et al., and Tzu et al.) to show obviousness (of independent *instant claim 8*). Responses to these further previous arguments from pages 29-32 of the brief are addressed above under sub-section B. a. (for instant claims 1 and 15).

**b. Dependent Claim 10:**

On page 56 of the brief, Appellant argues against the obviousness of dependent *instant claim 10* over the combination of Dao et al., Schroeder et al., and Tzu et al. (understood to be in further combination with either Levenson, Rolfson, or AAPA) based solely on the previous arguments in the brief with respect to independent instant claim 1 (which should have been independent instant claim 8 since this is the appropriate base claim). Responses to these previous arguments are addressed above under sub-section *D. a.* for instant claim 8 (from which *instant claim 10* depends).

**c. Dependent Claim 11:**

Also on page 56 of the brief, Appellant argues against the obviousness of dependent *instant claim 11* over the combination of Dao et al., Schroeder et al., and Tzu et al. (understood to be in further combination with either Levenson, Rolfson, or AAPA) based solely on the previous arguments in the brief with respect to independent instant claim 1 (which should have been independent instant claim 8 since this is the appropriate base claim). Responses to these previous arguments are addressed above under sub-section *D. a.* for instant claim 8 (from which *instant claim 11* depends).

**d. Dependent Claim 12:**

Further in the paragraph bridging pages 56-57 of the brief, Appellant argues against the obviousness of dependent *instant claim 12* over the combination of Dao et al., Schroeder et al.,

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and Tzu et al. (understood to be in further combination with either Levenson, Rolfson, or AAPA) based solely on the previous arguments in the brief with respect to independent instant claim 1 (which should have been independent instant claim 8 since this is the appropriate base claim). Responses to these previous arguments are addressed above under sub-section *D. a.* for instant claim 8 (from which *instant claim 12* depends).

**e. Dependent Claim 25:**

On pages 57-60 of the brief, Appellant repeats previous arguments from at least pages 17-20, 21-24, 26-29, 33-36, 40-42, 43-46, and 50-53 of the brief for contesting the obviousness of dependent *instant claim 25* over the combination of Dao et al. and Schroeder et al. (understood to be in further combination with Tzu et al. and either Levenson, Rolfson, or AAPA). Responses to these previous arguments are addressed in sub-sections *A. a.* and *B. a.* above for each of instant claims 1 and 15, in sub-sections *A. e.* and *B. e.* above for each of instant claims 24 and 26, in sub-sections *C. a.* and *D. a.* above for instant claim 8 (from which *instant claim 25* depends), and in sub-section *C. e.* above for instant claim 8 (from which *instant claim 25* depends).

*E. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA), and further in view of Sandstrom (US 2002/0125443).*

On pages 60-61 under sub-section E. 1. of the brief, Appellant restates the applicable rejection on appeal from the FINAL. The corresponding rejection is fully presented above in section (9) under the appropriate subheading for this sub-section E.

Response to the arguments under sub-section E. 2. on pages 62-63 of the brief:

**a. Dependent Claims 21 and 23:**

On pages 62-63 of the brief, Appellant traverses the obviousness of dependent *instant claims 21 and 23* over the combination of Sandstrom with Dao et al., Schroeder et al., and either Levenson, Rolfson, or AAPA by arguing that Sandstrom teaches away from the combination simply because Sandstrom does not specifically teach some aspects already covered by the other references.

In response to Appellant's arguments that Sandstrom does not specifically teach removing a second region of the opaque layer during the additional patterning to attack the substrate by etching for forming the PSM, which Appellant contends to teach away from the methods of forming the first and second regions of the PSM that include removing a second region of the opaque layer during the additional patterning step (as taught by Dao et al., Schroeder et al., and either Levenson, Rolfson, or AAPA, discussed above), the test for obviousness is not whether the features (or methods) of a secondary reference (e.g., Sandstrom, etc.) may be bodily incorporated into the structure or method of one or more primary references (e.g., Dao et al. and Schroeder et al. in combination with either Levenson, Rolfson, or AAPA, etc.); nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what

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the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Sandstrom teaches plural etching steps that attack the substrate to make a PSM and also specifically teaches that further etching of the substrate during the additional patterning of the PSM substrate is useful for improving uniformity. Sandstrom is not relied upon to teach the additional aspects that are already taught by other applicable references. In fact, one of ordinary skill in the art would have recognized that improving the uniformity of a PSM by further etching to attack the substrate during additional patterning to make the PSM (as taught by Sandstrom) would be reasonably expected to be just as advantageous for improving the uniformity in the combined method of making the PSM taught by the other references (Dao et al. and Schroeder et al. in combination with either Levenson, Rolfson, or AAPA, etc.). Since the particular sequence of etching method steps for making a PSM taught by Sandstrom are not required to be bodily incorporated together into the combined method for making a PSM taught by the other references, Sandstrom does not teach away from the combination method of making the PSM taught by Dao et al., Schroeder et al. and either Levenson, Rolfson, or AAPA in combination with Sandstrom (as discussed above). Therefore, Appellant's arguments regarding dependent *instant claims 21 and 23* are not convincing.

*F. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dao et al. (US 5,302,477), especially in view of Schroeder et al. (US 2003/0027057), further in view of Tzu et al. (US 5,888,678), further in view of either Levenson (US 6,251,549), Rolfson (US 6,395,432), or Appellant's admitted prior art (AAPA), and further in view of Sandstrom (US 2002/0125443).*

On pages 63-67 under sub-section E. 1. of the brief, Appellant restates the applicable rejection on appeal, as well as copying from the response to argument section in the FINAL. However, the response to argument section restated by Appellant (on pages 64-67 in the brief) is taken out of context and appears to be largely irrelevant, since applicable portions thereof are separately stated as needed in this Office action. The corresponding rejection alone is presented above in section (9) under the appropriate subheading for this sub-section *F*.

*Response to the arguments under sub-section F. 2. on pages 67-68 of the brief:*

**a. Dependent Claim 22:**

On pages 67-68 of the brief, Appellant traverses the obviousness of dependent *instant claim 22* over the combination of Sandstrom with Dao et al., Schroeder et al., Tzu et al., and either Levenson, Rolfson, or AAPA by arguing that Sandstrom teaches away from the combination simply because Sandstrom does not specifically teach some aspects already covered by the other references.

In response to Appellant's arguments that Sandstrom does not specifically teach removing a second region of the opaque layer during the additional patterning to attack the substrate by etching for forming the PSM, which Appellant contends to teach away from the methods of forming the first and second regions of the PSM that include removing a second region of the opaque layer during the additional patterning step (as taught by Dao et al., Schroeder et al., and either Levenson, Rolfson, or AAPA, discussed above), the test for obviousness is not whether the features (or methods) of a secondary reference (e.g., Sandstrom, etc.) may be bodily incorporated into the structure or method of one or more primary references (e.g., Dao et al., Schroeder et al.,



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and Tzu et al. in combination with either Levenson, Rolfson, or AAPA, etc.); nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Sandstrom teaches plural etching steps that attack the substrate to make a PSM and also specifically teaches that further etching of the substrate during the additional patterning of the PSM substrate is useful for improving uniformity. Sandstrom is not relied upon to teach the additional aspects that are already taught by other applicable references. In fact, one of ordinary skill in the art would have recognized that improving the uniformity of a PSM by further etching to attack the substrate during additional patterning to make the PSM (as taught by Sandstrom) would be reasonably expected to be just as advantageous for improving the uniformity in the combined method of making the PSM taught by the other references (Dao et al., Schroeder et al., and Tzu et al. in combination with either Levenson, Rolfson, or AAPA, etc.). Since the particular sequence of etching method steps for making a PSM taught by Sandstrom are not required to be bodily incorporated together into the combined method for making a PSM taught by the other references, Sandstrom does not teach away from the combination method of making the PSM taught by Dao et al., Schroeder et al., Tzu et al., and either Levenson, Rolfson, or AAPA in combination with Sandstrom (as discussed above). Therefore, Appellant's arguments regarding dependent *instant claim 22* are not convincing.

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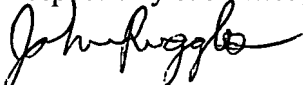
**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

***Conclusion***

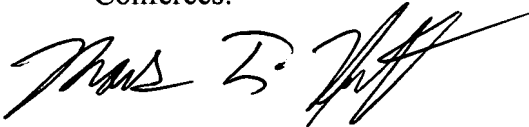
Appellant's arguments presented in the appeal brief regarding claims 1,3-5, 8, 10-12, 15, 17-18, and 21-26 are not deemed to be persuasive. Responses are presented above to address the arguments in the appeal brief.

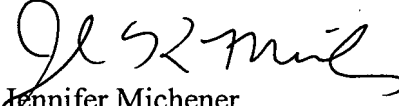
For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,  
  
John Ruggles  
Examiner  
Art Unit 1795

jsr  
November 2007

Conferees:

  
Mark F. Huff  
Supervisory Patent Examiner  
Art Unit 1795

  
Jennifer Michener  
TC Appeals Specialist  
Technology Center 1700

**IN THE CLAIMS:**

Please cancel claims 6, 13, and 19; add new claims 24, 25, and 26; and, amend the remaining claims follows:

1. (Currently Amended) A method of forming a phase shift mask, said method comprising:
  - forming an opaque layer on a transparent substrate;
  - performing a first patterning of said opaque layer to expose a first region of said transparent substrate, wherein said first region comprises an uninterrupted rectangular surface;
  - etching said first region of said transparent substrate to create a phase shift region within said transparent substrate; and
  - performing additional patterning of said opaque layer to expose a second region of said transparent substrate, such that said second region comprises a similar shape and size as said first region, wherein said second region is adjacent said first region, and wherein said additional patterning process enlarges an opening formed in said first patterning process.
2. (Cancelled).
3. (Original) The method in claim 1, wherein said first region and said second region comprise a continuous area of said transparent substrate.

4. (Original) The method in claim 1, wherein said opaque layer comprises a chrome mask.

5. (Original) The method in claim 1, wherein said transparent substrate comprises a quartz substrate.

6. (Cancelled).

7. (Cancelled).

8. (Currently Amended) A method of forming a phase shift mask, said method comprising:

forming an opaque layer on a transparent substrate;

performing a first patterning of said opaque layer to expose first regions of said transparent substrate, wherein said first regions comprise uninterrupted rectangular surfaces;

etching said first regions of said transparent substrate to create phase shift regions within said transparent substrate; and

performing additional patterning of said opaque layer to expose second regions and third regions of said transparent substrate, such that said second regions comprise similar shapes and sizes as said first regions, wherein said second regions are adjacent said first regions and said third regions are separated from said first regions, such that said third

regions are devoid of phase shift features, and wherein said additional patterning process enlarges openings formed in said first patterning process.

9. (Cancelled).

10. (Original) The method in claim 8, wherein each pair of said first regions and said second regions comprises a continuous area of said transparent substrate.

11. (Original) The method in claim 8, wherein said opaque layer comprises a chrome mask.

12. (Original) The method in claim 8, wherein said transparent substrate comprises a quartz substrate.

13. (Cancelled).

14. (Cancelled).

15. (Currently Amended) A method of forming a phase shift mask, said method comprising:

forming an opaque chrome layer on a transparent quartz substrate;

performing a first patterning of said opaque chrome layer to expose a first region of said transparent quartz substrate, wherein said first region comprises an uninterrupted rectangular surface;

etching said first region of said transparent quartz substrate to create a phase shift region within said transparent quartz substrate; and

performing additional patterning of said opaque chrome layer to expose a second region of said transparent quartz substrate, such that said second region comprises a similar shape and size as said first region, wherein said second region is adjacent said first region, and wherein said additional patterning process enlarges an opening formed in said first patterning process.

16. (Cancelled).

17. (Original) The method in claim 15, wherein said first region and said second region comprise a continuous area of said transparent quartz substrate.

18. (Original) The method in claim 15, wherein said opaque chrome layer comprises a chrome mask.

19. (Cancelled).

20. (Cancelled).

21. (Previously Presented) The method in claim 1, wherein said etching and said additional patterning both attack said substrate.
22. (Previously Presented) The method in claim 8, wherein said etching and said additional patterning both attack said substrate.
23. (Previously Presented) The method in claim 15, wherein said etching and said additional patterning both attack said substrate.
24. (New) The method in claim 1, wherein said uninterrupted rectangular surface lacks an intervening structure.
25. (New) The method in claim 8, wherein said uninterrupted rectangular surfaces lack intervening structures.
26. (New) The method in claim 15, wherein said uninterrupted rectangular surface lacks an intervening structure.